July/August 2000

Zoogœr

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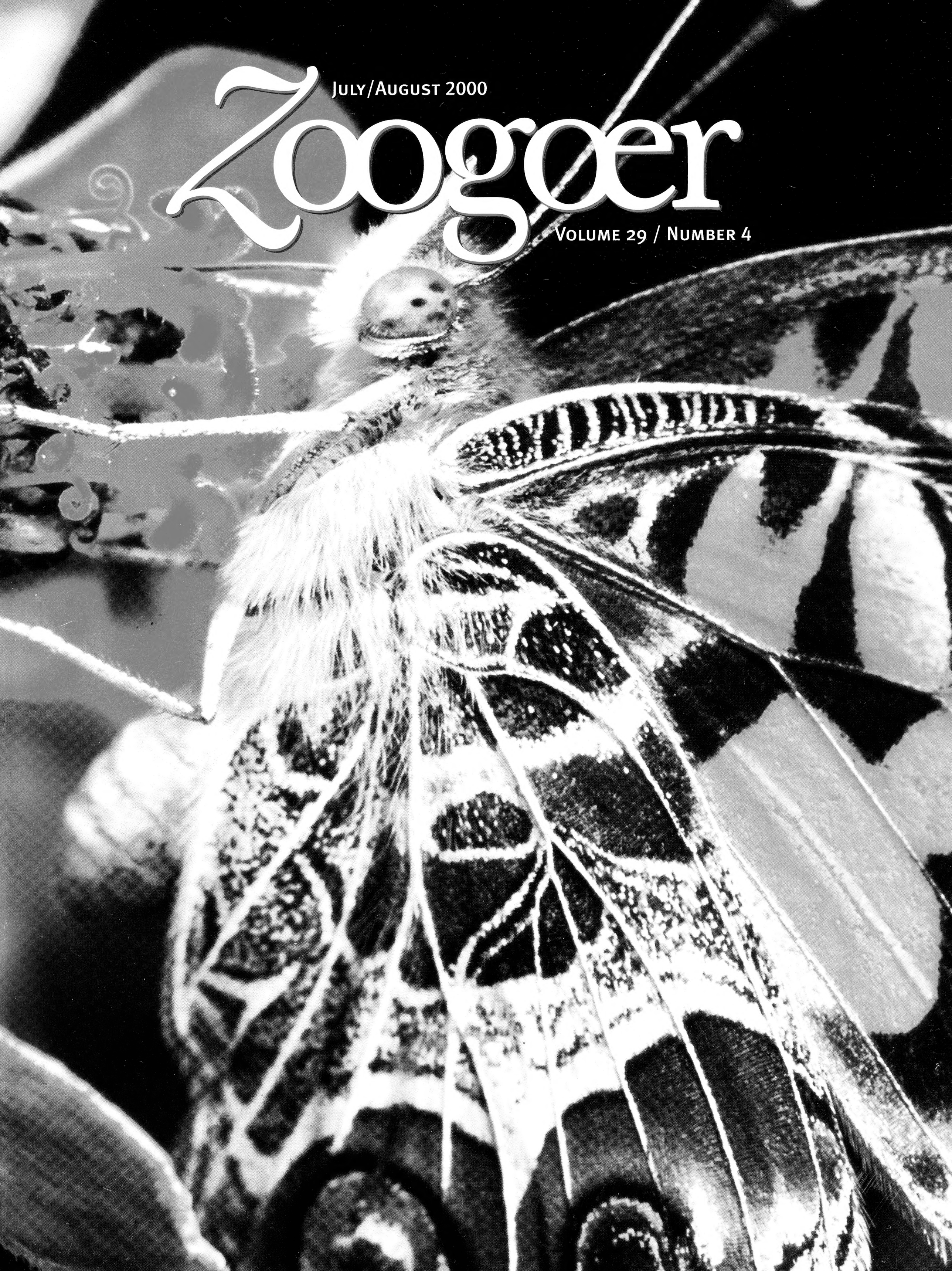

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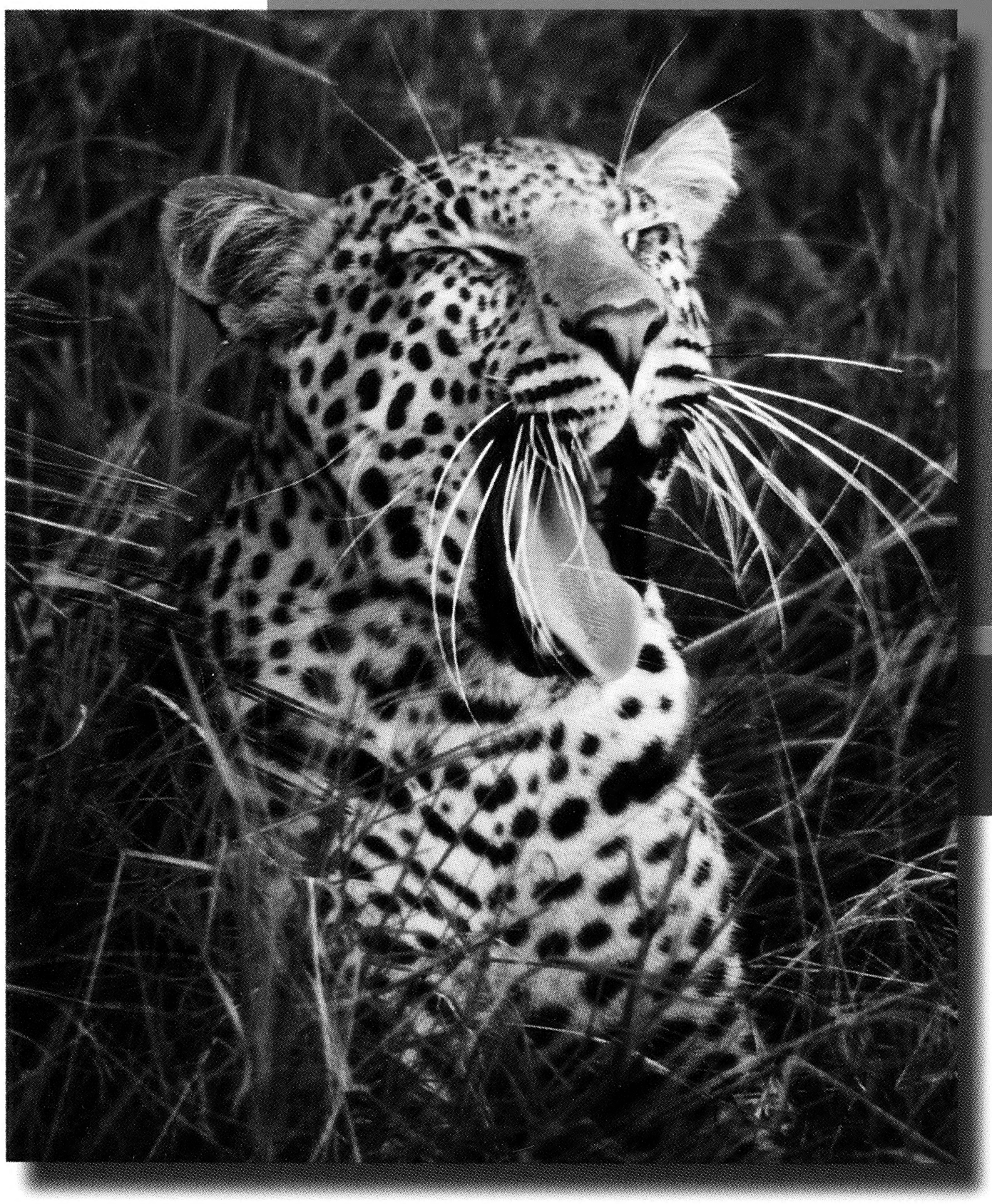

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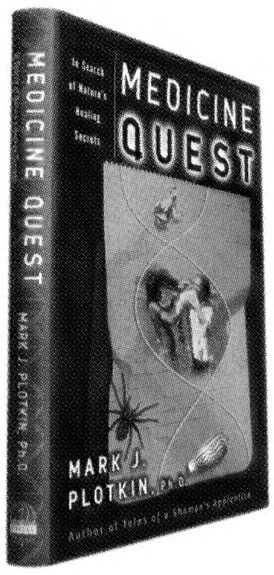
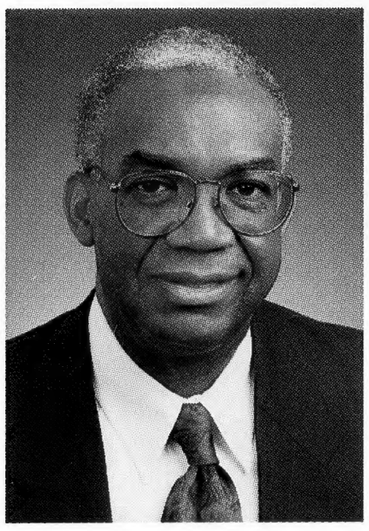


THE ZOO WELCOMES A NEW DIRECTOR

MICHAEL H. ROBINSON, RETIRED DIRECTOR OF THE NATIONAL ZOO, CONGRATULATES LUCY H. SPELMAN ON HER APPOINTMENT.

On June 19, Smithsonian Secretary Lawrence Small announced the appointment of Lucy H. Spelman, chief veterinarian in the Department of Animal Health at the National Zoo, as the new Director of the Zoo. She replaces Michael H. Robinson, who retired as Zoo Director in April.

Lucy Spelman has been at the Zoo since 1995, when she joined the staff as associate medical officer; she became senior veterinary officer in 1999. In that time, she instituted a rigorous preventive medicine program for the long-lived species at the Zoo, including gorillas and bears, and has conducted clinical research on anesthesia techniques for problem animals such as otters and sea lions, and on treatments for geriatric zoo animals. She oversaw the treatment of giant panda Hsing-Hsing to make his geriatric years here comfortable, and will serve as chief veterinarian for the new pandas expected to come here from China in the next year.



Secretary Small summarized the new Director's most important qualifications, saying, "Lucy brings to this position one of the most important attributes we looked for — her love and thorough knowledge of animals. But she also is deeply committed to the public and to making sure that visitors have a great experience at the National Zoo. As clinical veterinarian at the Zoo for the past five years, Lucy has proven herself to be an outstanding leader, researcher, and scientist."

At a meeting of Zoo and FONZ staff, Spelman outlined her and the Secretary's vision for the Zoo. Both want to see the Zoo become critically acclaimed as the best zoo in the world for our animal collection, our facilities, our practice and research in veterinary medicine and reproductive biology, and the number of visitors each year inspired by our exhibits. FONZ could not agree more strongly and will do all we can to make this vision a reality.

Please join all of us at Friends of the National Zoo in congratulating Lucy on her appointment and supporting her efforts to make the National Zoo the world's best zoo.

Sincerely,

Clinton A. Fields
Executive Director

Friends of the National Zoo is a nonprofit organization of individuals, families, and organizations who are interested in helping to maintain the status of the Smithsonian National Zoological Park as one of the world's great zoos, to foster its use for education, research, and recreation, to increase and improve its facilities and collections, and to advance the welfare of its animals.

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The Smithsonian National Zoological Park is located at 3001 Connecticut Ave., N.W., Washington, DC 20008-2537. Weather permitting, the Zoo is open every day except December 25. Hours: From May 1 to September 15, grounds are open from 6 a.m. to 8 p.m.; buildings, 10 a.m. to 6 p.m. From September 16 to April 30, grounds are open from 6 a.m. to 6 p.m.; buildings, 10 a.m. to 4:30 p.m.

Membership in FONZ offers many benefits: publications, discounts on shopping, programs, and events, free parking, and invitations to special programs and activities to make zoogoing more enjoyable and educational. To join, write FONZ Membership, National Zoological Park, Washington, DC 20008, or call 202.673.4961.

Membership categories and annual tax-deductible dues are:

Family (includes children 3-16 years)	$47
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Editor: Susan Lumpkin
Associate Editor: Alex Hawes
Editorial Assistant: Sue Zwicker
Interns: Laura Zajac, Katie Venit
Contributing Editors: Robin Meadows, Howard Youth
Consulting Editor: Robert Hoage
Copy Editor: Jean B. McConville
Design: Lloyd Greenberg Design, LLC
Advertising Sales: Joyce Rains; 301.530.0583

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Cover photo: A painted lady butterfly (*Cynthia cardui*) extracts nectar from a *Zinnia* sp. flower.
Photo by Carll Goodpasture.

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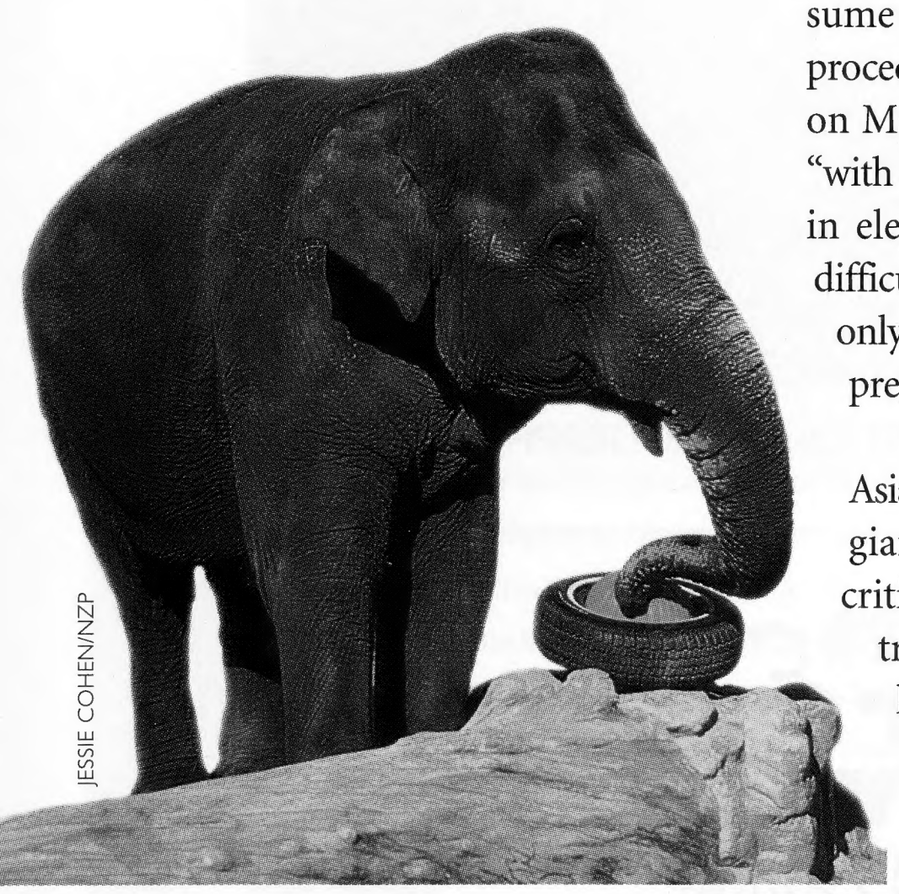
NOTES & NEWS

ANIMAL NEWS

Shanthi, our 24-year-old Asian elephant, is pregnant! Who's the happy father? A bull named Calvin who resides in Canada.



JESSIE COHEN/NZP

THE ASIAN ELEPHANT SHANTHI.

Shanthi and Calvin have never met; the pregnancy resulted from artificial insemination (AI). After five unsuccessful AI attempts over the last five years, Shanthi failed to resume cycling after a February AI procedure. A sonogram conducted on May 30 confirmed that she is "with child." Artificial insemination in elephants is a fairly new and difficult procedure, and Shanthi is only the fifth elephant to become pregnant in this manner.

With an estimated 40,000 Asian elephants worldwide, these giant mammals may not be as critically endangered as compatriots such as the greater one-horned Asian rhino (about 2,000 left). But with continued poaching and human pressure on Asian elephant habitat, scientists must learn as much as possible about these animals, including how to breed them successfully in zoos. In 1993, Shanthi delivered a 275-pound calf named Kumari, who died at 16 months of age from a deadly herpes virus. A treatment for the virus has since been developed by National Zoo pathologist Richard J. Montali and his colleague at The Johns Hopkins School of Medicine, Laura Richman. The treatment has already been used twice to save the lives of infected elephant babies.

In smaller-sized news, you can now find a fascinating example of symbiosis—the close, prolonged association between organisms of different species—at a new salt water tank in the Zoo's Amazonia Science Gallery. Visitors can watch colorful false clown fish dart in and out of the protection of serenely beautiful carpet anemones, while snails and cleaner shrimp mind their own business in the same tank.

The painful zap of the anemone's nematocysts, or stinging cells, wards off fish that would otherwise find a clown fish a tasty morsel. The clown fish don't get stung because a special substance in their external mucous discourages the anemone's stinging cells from firing. It is rare for a clown fish to wander far from that guardianship. The benefit to the anemones is more ambiguous. They may profit from bits of food brought close by the clown fish, and some research suggests that anemones with clown fish are also less likely to be nibbled on by predatory fish.

ZOO HOE DOWN

ALEX HAWES/FONZ

"SALSA WITH THE SALAMANDERS" LAST APRIL.

You don't need a Stetson or custom-leather cowboy boots to enjoy our Young Professionals dance party, **Two-Step with the Tigers**, on August 24 at the Zoo. Just bring a smile and a little southern charm. From 6 p.m. to 9 p.m., you can snack on appetizers, drink from our cash bar, take in an animal demo, and maybe learn a few dance steps. Admission is $8 pre-registered, $10 at the door. Visit www.fonz.org/getinv/yp.htm or call 202.673.4962 to register or for further information.

CORRECTION: The photo of a red-headed woodpecker that ran on page 25 of the May/June *ZooGoer* was taken by Jeffrey A. Spendelow. We apologize for the error.

"GREEN" BEANS

You're sitting at the bay window with your morning cup of coffee, watching the birds at your feeder. What type of coffee should you be drinking? An organic, shade-grown brew, of course. Shade-grown coffee is produced under the canopy of trees, whereas many companies grow their coffee beans in open fields, using pesticides to kill off marauding insects. A large number of Neotropical bird species need trees for the seeds and fruits they produce or for a place to nest. Others depend upon the forest insects for food. Many of these Latin American and Caribbean birds only winter down south and migrate to places north—such as your backyard—in the summer months. So the type of coffee you purchase has an impact on the type of birds that visit your feeder.

Now you can buy organic, shade-grown coffee guilt-free at the National Zoo Bookstore and concession stands, and at all Smithsonian Museum Shops. For more information on where else to buy shade-grown coffee, check out www.si.edu/smbc/coffee/cafelist.htm.

—Sue Zwicker

ONE SHUTTERBUG'S LOVE FOR THE BIRDS AND THE BEES

BY SARA MCKINSTRY

PHOTOGRAPHS BY
CARLL GOODPASTURE

According to Carll Goodpasture, there is nothing more beautiful to photograph than a flower and a bug. And you need look no further for proof than "Vanishing Pollinators," a new exhibition of 34 of Goodpasture's photographs that opened this past May at the Smithsonian National Zoo's Visitor Center and Amazonia Science Gallery.

Goodpasture's images of flowers and their insect pollinators are striking. Bright yellows, greens, pinks, and blues pop before your eyes. Lean in closer, and imagine the buzzing of bees, the quiet hovering of butterflies, or the gentle flutter of hummingbird moths. You can almost smell the fragrance of poppies and apple blossoms and taste the sweet fruits many plants provide. And, like Goodpasture, you can feel yourself falling in love with the beauty and grace of flowers and their visiting pollinators.

"We were so taken by Carll's photographs that they had to become the subject of a special exhibition," explains Miles Roberts, head of the Amazonia Science Gallery and curator of "Vanishing Pollinators." "The National Zoo continually works to raise the public's awareness of major environmental issues, and the Amazonia Science Gallery in particular is a place where science and art are brought together to educate and engage the public. Carll's photographs fit perfectly into this tradition."

HOVERFLY (*SYRPHUS*) FEEDING FROM THE ANTHERS OF A MALE BLADDER CAMPION FLOWER (*SILENE VULGARIS*).

Uniting science and art, "Vanishing Pollinators" brings to life the intimate relationship between flowering plants and their animal pollinators. But while the striking beauty of the exhibition's photographs seems eternal, the relationship they showcase is threatened.

Pollinators and flowering plants are inescapably linked and mutually dependent. In about 80 percent of the world's flowering plants, insects transport pollen between flowers, allowing them to reproduce. But urban sprawl, the conversion of wilderness to agriculture, disease, and the inappropriate use of pesticides endanger many pollinators, including bees, flies, moths, butterflies, birds, and bats. Should the pollinators that plants depend upon vanish, we could lose many of the foods we enjoy every day—from apples and melons to coffee

CRAB SPIDER

and chocolate—not to mention the planet's wild flowering plants themselves and the ecosystems of which they are a part.

The Awakening of a Nature Shutterbug

"I was alarmed to notice each year fewer species of butterflies and native bees in my garden and dismayed to learn that there is little research on pollinator decline worldwide," explains Goodpasture of why he got involved in using photography to increase public awareness of the importance of pollinators.

In fact, it was wondering about these declines that got Goodpasture interested in nature photography in the first place. In 1990 Goodpasture was an accomplished cytogeneticist studying cell, gene, and chromosomal biology in New Mexico. Although an avid photographer for the last 25 years, he saw photography as a hobby, not a profession. But when he began teaching biology courses at several colleges—which required him to research and lecture about ecology and the environment—Goodpasture's life suddenly changed.

"My students woke me up," he explains. "I became passionate about the environment and began to realize the significance of our society's growing disconnection with nature."

Goodpasture could ignore his passion no longer. In 1994, he quit his job as a research

K A T Y D I D

NOT ALL FLOWER VISITORS ARE POLLINATORS. OFTEN WELL CAMOUFLAGED, CRAB SPIDERS HIDE AMONG FLOWER PETALS TO PREY ON FORAGING BEES AND BUTTERFLIES (FAR LEFT).

A KATYDID (*SCUDDERIA* SP.) MUNCHING ON GOLDENROD (*SOLIDAGO CANADENSIS*) DOES MORE HARM THAN GOOD TO THE PLANT.

scientist at the Institute for Medical Genetics at the University of Oslo to teach biology, photograph nature, and speak out on environmental issues. He and his wife, Gro Heining, also an artist, moved into a 200-year-old log home set in an orchard in rural Norway. They soon found that living a relatively simple life surrounded by nature inspired their art. By 1997, Goodpasture was eagerly photographing flowers and their pollinators. What began as a curious investigation of what was happening in his own backyard soon took on a life of its own. In the summer of 1998, Goodpasture's photographs were exhibited at the Oslo Botanical Gardens, attracting more than 10,000 visitors.

Flowers, Bees, and Technology

What makes Goodpasture's photographs so appealing is their resemblance to abstract works of art, an effect he achieves by using close-up and macro photographic techniques. Goodpasture takes all his photographs in nature, working essentially in two different ways: either setting up equipment in the field to wait for some action, or actively stalking a particular subject, camera at the ready. He uses a mixture of different lenses, film types, flash units, backgrounds, and natural light to record every detail of his subjects—from the shadows of a flower's petals to the quick movements of a

HOVERFLY

A HOVERFLY (*SYRPHUS*) FEEDS ON WILD ROSE POLLEN. GOOD INSECTS TO HAVE AROUND THE GARDEN, HOVERFLIES POLLINATE GARDEN FLOWERS, WILD PLANTS, AND FRUIT TREES, AND THEIR LARVAE FEED ON APHIDS.

hoverfly's wings. To capture butterfly-sized insects, for example, he might use a single flash mounted on a home-made bracket and a telephoto macro lens mounted on a small extension tube. To photograph less active insects, he might use multiple flash units and a 60-mm macro lens. But whatever his equipment, his window for capturing an image is fleeting.

"I see what I photograph only for a moment," Goodpasture explains. "The process is intuitive and emotional. You take a picture of what grabs you. A good close-up photo is a coincidence of chance and years of preparation. I call this visual thinking—capturing a rare and magic moment."

But taking the photograph is just the first step. Goodpasture uses computer editing and digital technology to enhance each image's detail, color, and contrast. The images are then printed using a process first developed by legendary folk-rock musician Graham Nash. For more than 30 years, Nash took photographs while on tour with his band, Crosby, Stills, and Nash. Unable to find a studio that could develop his pictures to his liking, Nash teamed up in 1990 with his former road manager, Mac Holbert, to develop new methods of digital imaging. Goodpasture uses Nash's process to print his images onto fine-art paper using an ink-jet printer with nozzles that spray

L E A F B E E T L E

LEAF BEETLE CLEANING POLLEN FROM ITS FEET. STICKINESS HELPS A PLANT'S POLLEN BE TRANSPORTED FAR FROM ITS ROOTS, ENABLING FERTILIZATION AND REPRODUCTION WITH A GENETICALLY DIVERSE POPULATION OF FLORAL PARTNERS.

organic dyes at the speed of millions of micron-sized dots per second. The result is a velvety, watercolor-like feel and a three-dimensional appearance that bring the photographs to life.

Through the "Vanishing Pollinators" exhibition, Goodpasture hopes to raise awareness of the crucial ecological and economic benefits pollinators provide, the rapid decline of pollinators worldwide, and the simple things we all can do in our backyards to protect them. He believes that only by experiencing natural beauty will people feel empathy and respect for nature.

"I believe that visual art can help us perceive and understand the natural world," says Goodpasture. "Because images can be used to inform and to inspire, photographing nature is an appropriate response to the global emergency of accelerating biodiversity loss."Z

"Vanishing Pollinators" opened May 5, 2000, at both the Amazonia Science Gallery and the Visitor Center. The exhibit will run through April 2001 before traveling to other sites in the U.S. For more information about the exhibit and about pollinators, visit www.si.edu/pollinators *and check out previous* ZooGoer *articles on pollination at* www.fonz.org/zoogoer/zg1999/28(1)pollinators.htm *and* www.fonz.org/zoogoer/zg1995/pollinat.htm.

—Sara McKinstry

R.A. MITTERMEIER

KAYAPÓ WARRIOR.

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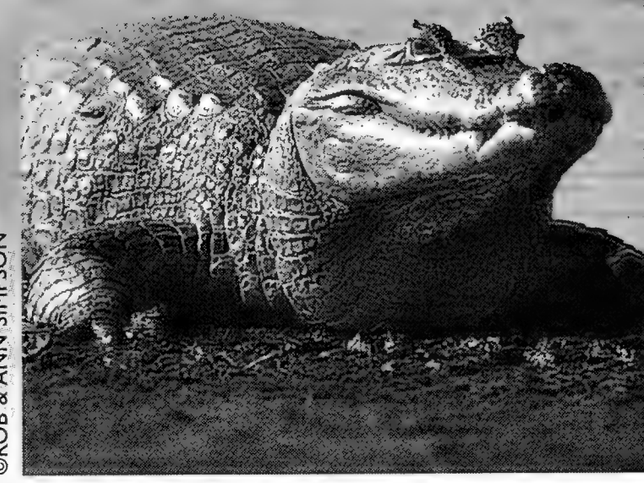
BLUE-AND-GOLD MACAW
(*ARA ARARAUNA*).



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SPECTACLED CAIMAN (*CAIMAN CROCODILUS*).

The Lure of Green Eden

BY ALEX HAWES

Five miles downriver from the Brazilian jungle city of Manaus, the main arm of the Amazon, the Rio Solimões, joins its largest tributary, the Rio Negro. Each branch holds more water than any other river on Earth. Here at the Meeting-of-the-Waters the dark, acidic tea of the Rio Negro collides with the Solimões' rich, café au lait current. A cleft of choppy, black and brown waves stretches 12 miles before the two currents finally blend to form the mighty Amazon.

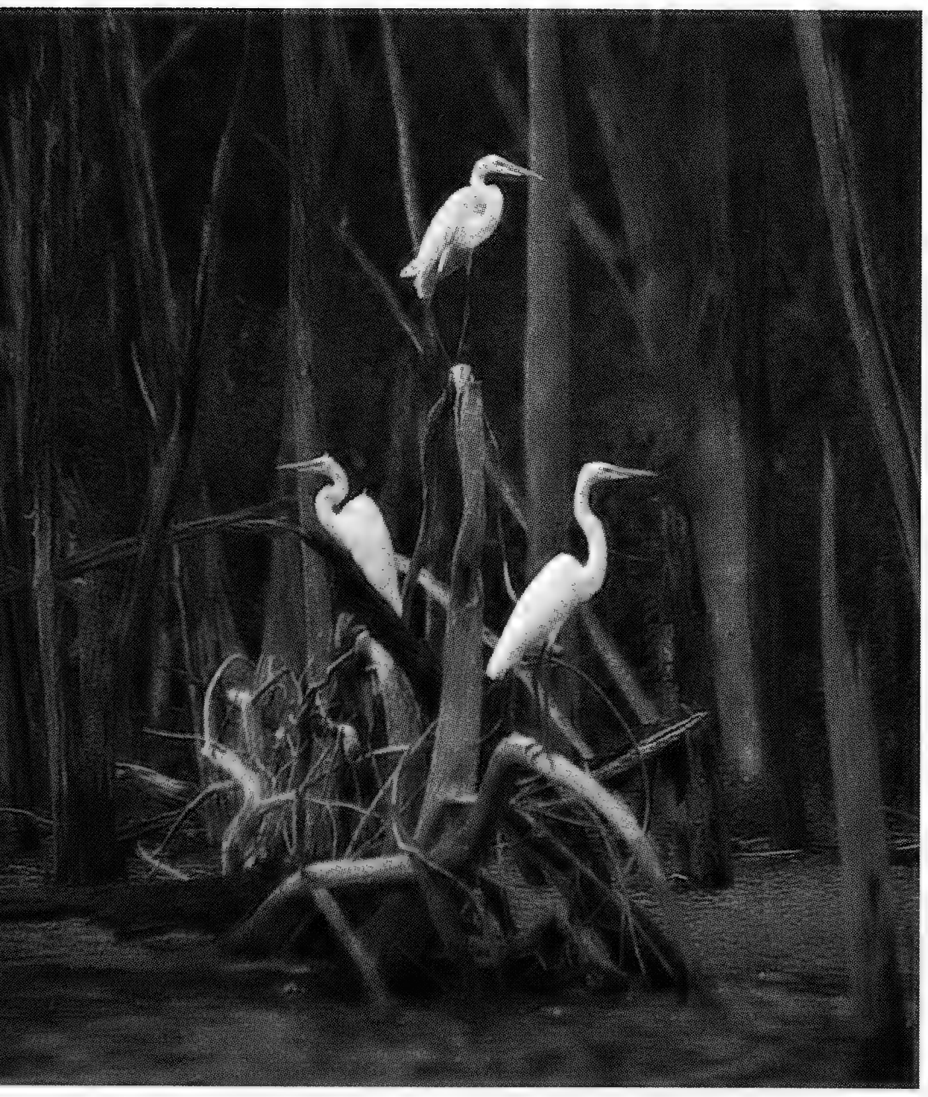
ALEX HAWES/FONZ

JAGUAR (*PANTHERA ONCA*)

Back in Manaus, an industrial city of 1.5 million and the origin of many an Amazon adventure, equally resolute forces of development and conservation, travel and culture, converge. At the confluence of these surging social tides is a concept with a hundred meanings and a thousand bends: ecotourism. Its definition remains as murky as the Amazon's silt-laden currents; its implications run as deep and as far.

Nowhere are ecotourism's potential benefits more critical than in Amazonia. The water-recycling and air-conditioning rainforests here have been dubbed "the lungs of the Earth." Yet distant macroeconomic forces have conspired to make consumptive derivatives of the Brazilian jungle—particularly timber, natural gas, minerals, and cattle—valuable in the short term. As loggers and ranchers burn holes into the once-blanketing forest canopy, Brazil's wildlife defenders are sent scrambling for help. To them, tourism might offer a sustainable and profitable alternative.

Brazil's vast forests and 4,000-plus miles of coastline offer heavenly possibilities for the aspiring ecotourist. A nation of natural superlatives, Brazil boasts the world's largest tropical wilderness, most massive river, and most extensive freshwater archipelago, and houses the largest inventory of plant and animal species of any country—including the most primates, amphibians, and flowering plants, and the largest snake, rodent, moth, and ant.



ALEX HAWES/FONZ

GREAT EGRETS (*CASMERODIUS ALBUS*).

By all rights, Brazil should be an ecotourist paradise. Yet it ranks far down—fiftieth!—on the list of countries whose economies most depend on tourism, and behind Egypt, Turkey, Thailand, and Korea (not to mention France and the United States) in gross tourism receipts. The nation has stumbled and staggered into a highly competitive, and fickle, nature travel market, where a lush rainforest with intriguing indigenous cultures and wondrous wildlife could equally well describe Panama, Ghana, or Papua New Guinea. Tourism in and around Manaus has dropped 40 percent over the last decade, according to Brazil's ecotourism association, EcoBrasil. Foreign travelers are taking their business to jungles elsewhere.

Moreover, the stream of travel revenue that does flow into the Brazilian Amazon rarely trickles past the tour operators and hotel owners. Only an occasional droplet reaches the *caboclos* in the forest—the rubber tappers and manioc farmers and piranha fishermen of mixed European and Indian heritage, from whom the government bans the firewood of the region's lush forests and the meat of the giant arapaima (indeed, the world's largest freshwater fish).

To most conservationists, nature travel that doesn't reward both man and beast is not true ecotourism. For "green travel" to succeed—to sustain itself and all it touches—not only must tourists go home happy. The local residents, ultimate caretakers of the environmental attractions nature travelers seek, must benefit too. If not, tourism transmutes into something far less attractive. It becomes an alien weed, like kudzu: spreading its strangling roots, contributing nothing.

Mexican economist Héctor Ceballos-Lascuraín first spawned the term "ecotourism" in the early 1980s. One could pick 1978, however, as the official dawning of the modern ecotourist era. In that year, Kenya banned hunting in an effort to save its vanishing herds of game animals. Safari outfits—the clever ones—recognized the potential for a new source of income, coining the slogan, "Come shooting to Kenya with your camera." And the foreigners came, with more than 1 million annual visitors, spending more than $350 million a year—and employing over 200,000 workers—having now made Kenya one of the world's premier tourist destinations.

But even the best intentions go awry. Shrewd marketers have since slapped the ecotourist label on anything and everything, whether their trips are environmentally sound or not. On the Himalayan trails of Nepal, hut owners burning wood to warm hikers have caused the treeline to retreat several hundred feet. In Yellowstone, plump little marmots (not to mention the grizzlies) have the *chutzpah* of Times Square panhandlers. And in Costa Rica—Latin America's ecotourist hotspot—some park visitors shake quetzal nests to capture the fleeing birds on film. After the 250 million or so yearly nature travelers go home, the Great Outdoors is rarely the same.

Brazil plunged headfirst into ecotourism a decade ago without first testing the waters. According to EcoBrasil data, the number of foreigners coming to Brazil has quadrupled to 4.8 million a year since 1990. The recent devaluation of the country's currency has made travel here more affordable. Yet most tourists to Brazil forego the rainforest, opting instead for big cities like São Paulo or the beaches of Rio. (The country is far from alone in this trend: About 60 percent of travelers to Kenya visit coastal resorts rather than game parks.) Brazil's government tourism board, Embratur, hopes to redirect this stream.

"I'm seeing Brazil try to change its image into being a more natural destination," says Lacey Gude, president of Virginia-based Gerosa Tours and Amazon Adventurers. "It's getting away from the three Ss: samba, sand, and soccer." Still, few people turn up at her office bent on traveling to Brazil's wildlands—due, she believes, to an overall lack of marketing abroad by the government. Indeed, most tourists in Brazil are Brazilian.

On the surface, Brazil furnishes the fields for many nature travel dreams. The volcanic Fernando de Noronha islands, near Recife, have earned the label the "Brazilian Galapagos" for the archipelago's countless sea turtles, dolphins, and coral reefs. The arid *cerrado* of the country's interior, roamed by anteaters and maned wolves, presents a botanic wonderland more diverse in flora than the East African savanna. Iguaçu Falls, along the Argentine border, thunders down a gorge two miles wide, delivering a rainbow for the cameras every time. The Pantanal's 360,000 square miles of swampland teem with storks, egrets, and spoonbills.

And then there's the Amazon, the central

R.A. MITTERMEIER

THREE-TOED SLOTH (*BRADYPUS* SP.).

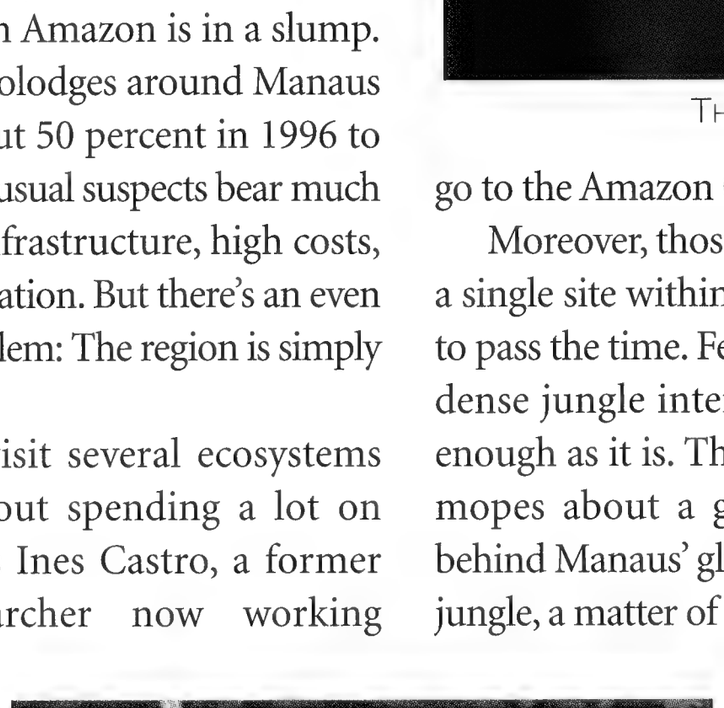
artery of the continent, flowing out of the Andes with the mellow pace of a *bossa nova* sax. Within the vast, unmapped Amazon rainforest hide crimson-faced uakari monkeys, majestic jaguars, and indigenous tribes like the Yanomami, once untouched by modernization.

Sadly, all is not well in paradise. Despite all the conservation projects and government proclamations, 6,500 square miles of Brazil's rainforest—more acreage than Connecticut—was uprooted in 1998, while fires sparked by slash-and-burn agriculture decimated another 3,000 square miles. The amount of Brazilian forest felled since 1971 could cover France.

Nature travel could offer Brazil an alternative to the haunting sight of stump-filled landscapes. Tourists paying to experience pristine wilderness, the theory goes, create an incentive for that wilderness' preservation. But while tourism to the Pantanal and Fernando de Noronha islands has increased moderately over the last decade, tourism to the Brazilian Amazon is in a slump. Occupancy at the 29 ecolodges around Manaus has dropped from about 50 percent in 1996 to 37 percent in 1999. The usual suspects bear much of the blame: lack of infrastructure, high costs, fear of crime, poor sanitation. But there's an even more fundamental problem: The region is simply too *big*.

"You can't easily visit several ecosystems within one trip without spending a lot on domestic flights," says Ines Castro, a former National Zoo researcher now working at Conservation International. Until Brazil decides to deregulate its domestic carriers, it will continue to be cheaper to fly from Rio de Janeiro to Miami than from Rio to Manaus.

"In Costa Rica, you can cross the country in a few hours. When you go to Brazil, you either go to the Amazon OR to the beach," says Castro.



ALEX HAWES/FONZ

WOOLLY MONKEY (*LAGOTHRIX LAGOTRICHA*).

Moreover, those travelers content to settle on a single site within the Amazon Basin find little to pass the time. Few established trails pierce the dense jungle interior, where visibility is hard enough as it is. The only jaguar you'll likely see mopes about a grim, concrete-floored cage behind Manaus' glitzy Hotel Tropical. In the real jungle, a matter of miles away as the macaw flies, you'll search for days in vain to find a wild jaguar. Spread over millions of acres, the wildlife blends all too well beneath the dense canopy ceiling. This isn't the thundering plains of the Serengeti. You can't point-and-click blindfolded.

Yet wildlife-spying opportunities do exist on a boat ride up the Rio Negro or Rio Solimões from the Amazon's fork near Manaus. With any luck you'll spot both pink and gray river dolphins, alligators and caimans, toucans and screaming pihas, coral snakes and tarantulas. Harder to find are ways to spend your cash that benefit the local populace.

Consider Jaú National Park, at 8,600 square miles the largest rainforest reserve in the world, bigger than New Jersey. The park harbors one of the world's largest moths, a beetle larger than your hand, and a species of woodcreeper (a bird) once believed extinct. Upriver from Manaus 18 hours by boat—and only by boat—the reserve has few full-time rangers, and no visitor center, trail system, hotel, or campground. Apart from wealthy European sport fishermen arriving by pontoon plane, Jaú sees few outside visitors. "It is a destination for the happy few," says Ariane Janer of EcoBrasil.

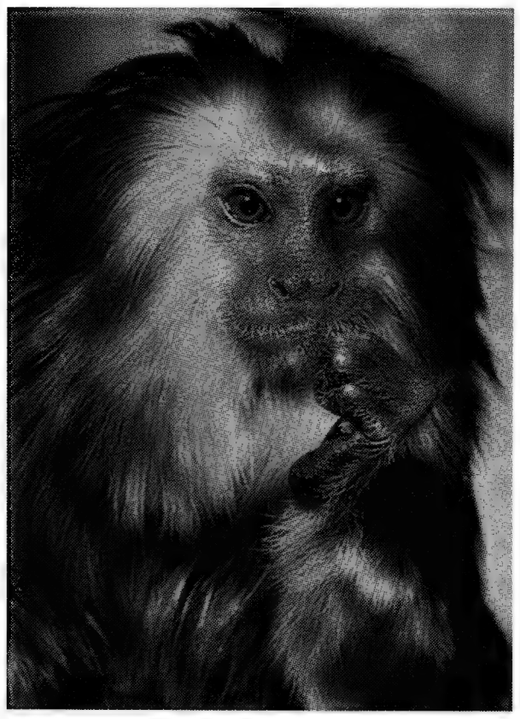
That may change some day. The government recently eliminated many of the bureaucratic procedures once necessary to gain entrance to the park. And World Wildlife Fund (WWF)-Brazil has formed a partnership with the Vitoria

RODERIC B. MAST

THE PIED BARE-FACED TAMARIN (*SAGUINUS BICOLOR*), AN ENDANGERED PRIMATE FROM NORTHERN BRAZIL.

SEARCHING FOR GOLD

"There are two rainforests in Brazil, and one of them is nearly gone," says Lou Ann Dietz of World Wildlife Fund-U.S. The one nearly gone is not famed Amazonia, but rather the Atlantic Forest habitat of southeastern Brazil. Conservation International (CI) considers this biologically rich ecosystem one of the three most threatened "hotspots" on the planet, and World Wildlife Fund targets the Atlantic Forest as one of its Global 200 areas of outstanding diversity to fight to conserve. Only eight percent of the original Atlantic Forest ecosystem remains, according to the latest estimate. Yet more than half of this habitat's tree species and 80 percent of its primate species—including the endangered muriqui (*Brachyteles arachnoides*), one of South America's largest and rarest monkeys—are found nowhere else on Earth.



JESSIE COHEN/NZP

GOLDEN-HEADED LION TAMARIN (*LEONTOPITHECUS CHRYSOMELAS*).

The National Zoo has played a crucial role in the conservation of one of the Atlantic Forest's imperiled jewels: the golden lion tamarin (*Leontopithecus rosalia*). About 310 golden lion tamarins in Brazil have been reintroduced from the National Zoo and other cooperating institutions, or descend from reintroduced individuals. Many live in and around the Poço das Antas Biological Reserve, one of the last remnants of tamarin habitat, 60 miles northeast of Rio de Janeiro.

Accustomed to human presence—and fitted with radio collars for research—the reintroduced tamarins are fairly easy for nature guides to track down. By law, tourism is not allowed within biological reserves in Brazil. However, those determined to see golden lion tamarins in the wild can visit private property surrounding Poço das Antas. Because the reserve itself has reached full capacity for tamarins, 15 private farms in the area have received reintroduced individuals. According to Dietz, some property owners have volunteered to host golden lion tamarins just for the sake of conservation; others have been convinced by the incentive of potential tourist dollars. One local farmer has recently built a small hotel that can house 20 guests.

Farther north in the Atlantic Forest, another dazzling creature—the golden-headed lion tamarin (*Leontopithecus chrysomelas*)—struggles for survival. Conservation International, with support from Anheuser-Busch, has built a canopy walkway at Una EcoPark, adjacent to the Una Biological Reserve, in order for tourists visiting the area's beach resorts to make a side-trip into this endangered creature's forest home.

"It's a fantastically beautiful area that reminds one of Kauai in Hawaii—white sand, black rocks, blue ocean," says Keith Alger, a conservation worker in Brazil currently on a fellowship with CI. More than 500 paying visitors, most Brazilian, ventured to Una EcoPark last January. Local school groups have also visited there to enjoy the sights and sounds of their neighborhood's primate treasure.

—Alex Hawes

GerosaAmazon Adventurers is now offering a tour to search for golden lion tamarins in the Atlantic Forest outside Poço das Antas. For more information, call 800.243.7672 or log onto www.amazon-adventurers.com.

Amazonica Foundation to explore tourist concessions for Jaú. The Foundation plans to open a community center there for the park's inhabitants, many of whom lack the birth certificates required for access to government social services.

Poachers hunting endangered turtles today enter the park at will; the locals have little incentive to stop them. More fruitful tourism operations could pay for guards to keep poachers away or inspire Jaú's residents to rely less on rare species of plants and animals for food. Yet WWF remains wary of blindly granting concessions to tourism "opportunists": travel agent wolves disguised in ecotourism wool.

And so Jaú's 1,000 or so indigneous residents—many living in stick-and-thatch shacks set on stilts above the river—for now see little financial gain from the reserve. Any tourism profit instead flows downriver: to the Manaus offices of the boat owners and tour operators and overseas to travel agents in the United States and England. While Jaú's inhabitants await their fate, the park's wildlife continues to have a higher value dead than alive.

"To a *caboclo*, an alligator looks more like dinner—or a monster—than an endangered species," says Mark Aitchison, a tour operator who runs a small ecotourism outfit in Manaus with his wife, Tania. Raised in Canada, Mark met Tania while backpacking through South America. Together they built a jungle lodge on Tania's family *fazenda* along the Rio Negro between Manaus and Jaú. They'd love to expand the lodge—to convert the inn to solar power, install chemical toilets, employ more locals—but the money's not there, he says.

"I think the real political will to address the many issues at play in the Amazon is lacking," says Mark in an email missive from the rainforest. "The government has to contend with Indian rights and lumber companies, hydroelectric companies and conservationists, starving interior people and crime in the city."

Across the Rio Negro from Mark's in-laws' home sits an embodiment of the ecotourism dilemma here in Brazil. It is the Ariaú Amazon Towers Hotel, a vast complex of luxury tree-top cabanas linked by 100-foot-high walkways. According to Ariaú legend, the hotel was inspired by Jacques Cousteau. In 1982, while on a year-long film pro-

Tourists paying to experience pristine wilderness, the theory goes, create an incentive for that wilderness' preservation.

ALEX HAWES/FONZ

ABUNDANT WILDLIFE AWAITS THE DEDICATED VISITOR TO THE AMAZON RAINFOREST.

ject in the region, Cousteau allegedly prognosticated: "The war of the future will be between those who defend nature and those who destroy it. The Amazon is going to be the eye of the hurricane. Scientists, politicians, and artists will disembark here to see what is being done with the forest."

Build a lodge here and they will come, Cousteau told Ariaú's founder, Ritta Bernardino. He wasn't wrong. The resort has quintupled in size to 210 rooms since its inception in 1986, attracting celebrities and heads-of-state: Kevin Costner, Bill Gates, Jimmy Carter, and Helmut Kohl, to name but a few. Ariaú even appeared in the nature/horror flick, "Anaconda." (Jon Voight, who co-starred in the film, later returned to the resort with his family.) The hotel has been favorably featured in *Money*, *Newsweek*, *Forbes*, and *Town & Country*. *Condé Nast* has twice placed Ariaú on its "Gold List" as one of the 100 best places to stay in the world.

But while Ariaú bills itself as paradise, some conservationists and ecotourism planners privately call it a "circus." Ritta, critics assert, has co-opted the surrounding rainforest to build his ever-expanding resort, with little concern for his indigenous neighbors.

"I've seen them dump their raw sewage in the river," says Oliver Hillel, a founder of EcoBrasil, now with Conservation International. Ariaú's generators can be heard for miles around, according to its neighbors. Approaching the hotel by boat, you'll spot half-tame spider monkeys climbing the walkway railings, looking for handouts or a shoulder to mount. One travel writer gushed that he'd seen more wildlife along Ariaú's three miles of catwalks than he had during several weeks trekking through the jungle.

The resort, circus or not, draws the crowds from far and wide. Ariaú receives an astounding 70 to 80 percent of the Manaus jungle lodge market, estimates Ariane Janer, a market analyst with EcoBrasil. Ritta hires ad agencies in the United States, and a North American representative for the company is just a toll-free call away.

Oliver Hillel wishes Ritta would contribute more of the hotel's revenue toward conservation efforts in Brazil. Defenders of Ariaú contend that "Dr. Ritta" as they call him—he has a Ph.D. in economics—built the lodge to celebrate the rainforest, not make money off it. Everyone else, they say, is just jealous.

According to hotel representatives, Ritta brings in doctors and medicine for residents of the surrounding villages. His generously paid employees no longer have to hunt river dolphins to sell on the black market for food. One ex-*caboclo* now is assistant manager, in charge of Ariaú's accounting.

"I'm impressed by what I saw," says Mark Plotkin, renowned ethnobotanist and author of *Medicine Quest* (see review, page 30). Plotkin has

ALEX HAWES/FONZ

MANAUS, A CITY THAT FLOURISHED—BRIEFLY—DURING THE RUBBER BOOM OF THE LATE 19TH CENTURY.

R.A. MITTERMEIER

INDIGENOUS BRAZILIANS AWAIT ECOTOURISM'S REWARDS.

"The war of the future will be between those who defend nature and those who destroy it. The Amazon is going to be the eye of the hurricane."

visited Ariaú twice. "There's no (direct) indigenous involvement. But it's creating jobs, and showing that money can be made off of the forest rather than by cutting it down for two dollars a tree."

"Other places are boring!" adds Jill Siegel, Ariaú's representative in New York. "You don't see animals when you're on the ground. And if you do see an animal, you're craning your neck to see it for one or two seconds as it flees through the trees. People get frustrated going to lodges on the ground."

Siegel says that countless visitors to Ariaú who have had no previous interest in conservation come away inspired to preserve nature. "It's a very profound place—to see the sun rising and setting in your room, in the canopy of the trees, to have monkeys looking in at you when you wake up," says Siegel. "There's nothing comparable in the entire Amazon." The high-minded ecotourist is left wondering whom to believe, and where to go. Often times, the conscientious traveler must simply guess, and hope for the best.

"Ecotourism isn't a panacea," warns Steve Edwards, a consultant in Conservation International's Ecotourism Program. Edwards avoids defining the practice too narrowly, fearful of discouraging entrepreneurs from giving ecotourism a try. Organizations like Conservation International and the World Wildlife Fund are, however, working on a certification system in Brazil to recognize ventures that preserve the environment while benefiting local communities.

The region has one advantage: Most tourism operations along the Amazon belong to Brazilians. By contrast, roughly two-thirds of Costa Rica's hotels are American-owned, according to Conservation International. And community-run alternatives are slowly emerging in Brazil.

For a purer example of the ecotourism ideal, venture to the town of Silves, four hours east of Manaus by car. The town sits at the outflow of five rivers—the Urubu, Itabani, Sanabani, Igarapé Açu, and Igarapé Ponta Grossa—and alongside the giant Canaçari Lake. For most of the year—when the rivers are running high—Silves is an island within Canaçari, so a motorized canoe will whisk you across the lake. During the dry season, flying fish may land inside the boat. During the rainy season, only the top half of trees emerge from the surface of the flooded forest.

Once on the island, a stone-paved street draws you through the town of Silves, past an old Catholic church, and up a gently sloping hill. The view from the top offers a sweeping vista of a network of rivers and lakes stretching toward the distant Amazon. Here you'll find the modest Aldeia dos Lagos hotel.

The hotel is but one part of the Silves Community Ecotourism Project, begun four years ago with support from WWF. The lakes ecosystem around Silves abounds with birds and aquatic wildlife. But commercial fishing over the last 20 years has dramatically reduced the fish populations—and the ability of local, artisanal fishermen to survive.

"Commercial fishermen had very predatory practices," says Nancy de Moraes, the Brazil desk officer for WWF. "They'd come and overfish with no thought to the future." The community pressured their municipality to create a lakes reserve protected from the giant, Manaus-based fleets. With the opening of the Aldeia dos Lagos hotel in late 1997, Silves residents have protected their financial livelihood while sustaining the ecosystem that churns about them.

A grassroots organization known as ASPAC (Associaçao de Silves pela Preservaçao Ambiental e Cultural) represents the community's interests. With financial support from WWF, the organization has initiated a project to monitor the fish stocks in the lakes and rivers of the region. ASPAC also created the Canaçari Tourist Company, based out of the hotel, to manage ecotourism in the surrounding areas. Visitors to Silves can now hire local guides for fishing expeditions (where permitted), night forays in search of caimans, or visits to the surrounding communities—to view, for example, the magic transformation of manioc into tapioca.

The project is still developing. The hotel has but 12 rooms so far, one-twentieth the capacity of Ariaú, a drop in the lake. Silves hopes to expand the hotel further, but Nancy de Moraes urges a measure of caution. "You want to bring some benefit to these communities, but you can't overdo it," she says. "You can't do something that's going to raise expectations, and raise the specter

A VISION OF THE NATURE TRAVEL DREAM LINGERS FAINTLY ON THE CONSERVATIONIST'S HORIZON.

of what they don't have. If you do it wrong, you can't go back again."

De Moraes remembers one trip she accompanied to the Peruvian Amazon in which an American woman, saddened by the poverty she saw, gave a family a $50 bill. A wave of resentment spread through the village's other families. Some Amazon communities have been promised financial success if they pursued sustainable tourism, but few tourists came. More resentment.

Nature travel must nurture—it's a seemingly simple axiom, yet one that's hard to follow. Champions of ecotourism in Brazil wonder if the Silves model will sprout and blossom elsewhere. Over the last decade, conservation groups have spread the sustainable development seeds far and wide. What emerges may help determine the future landscape of paradise.

"Every time I go [to the Amazon]," says Ariane Janer, "I'm impressed by its sheer dimensions of water and forest, the thunderstorms in the afternoon, the riverine peoples. The sense of really being somewhere else."

Reflecting back on those placid waters, the warm breeze, the symphony of the rainforest, one can feel a near-tangible bond forged with this primeval wilderness. But then comes the sudden pang of imagining a world without such splendor. This is nature travel's critical epiphany for the visitor.

At Silves, elderly residents have helped cobble together a map of the natural resources of their region. They eagerly point to places where the fish and forests have disappeared since their youth, and then discuss the possibility that the Silves Project may bring the fish back.

This is ecotourism's critical epiphany for the host. Z

—Alex Hawes is Associate Editor of ZooGoer.

For children ages 13 to 17 interested in studying the Amazon, FONZ will again offer its Eco-Explorers teen travel program to Peru in July 2001. Kids can investigate current research and conservation efforts aimed at protecting the rainforest during this eight-day trip. For FONZ members of all ages, we are also organizing an ecotour of the Peruvian Amazon—run by an environmentally responsible, Peruvian-owned company—October 7 through 14, 2000. Log onto www.fonz.org/getinv/travel.htm, *or call 202.673.4613 for more information.*

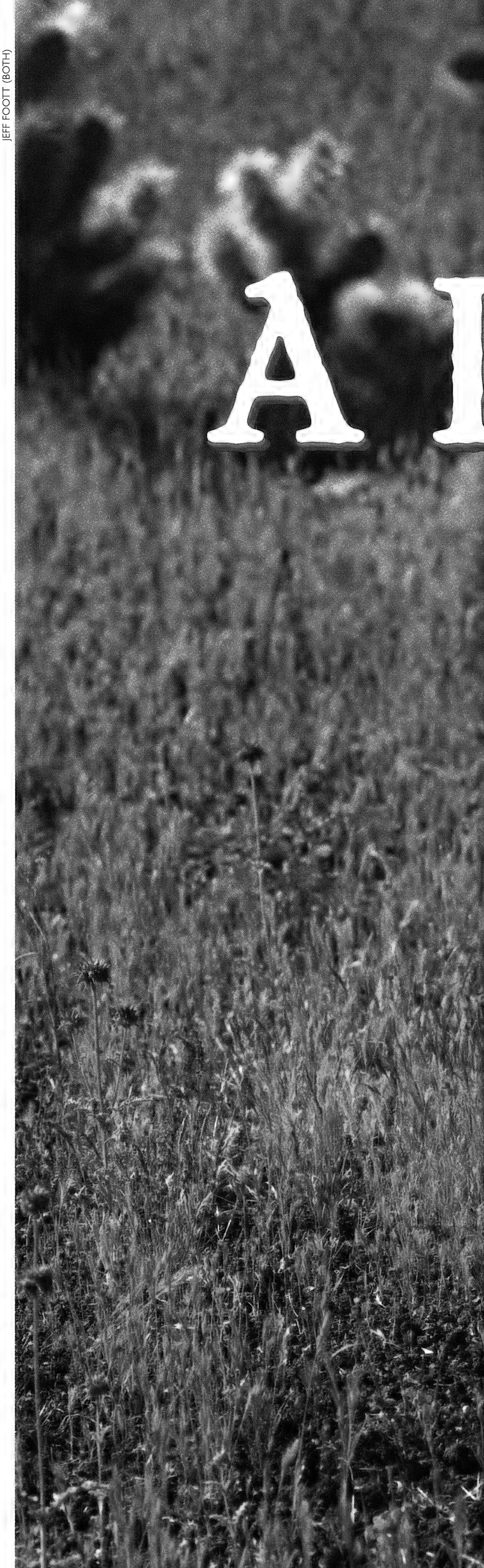
BY SUSAN LUMPKIN

Realizing there's no such thing as the Easter Bunny creates a crisis of faith. If there's no Easter Bunny, could there be no Tooth Fairy, or Santa Claus, or Man in the Moon? We rarely recover from this shock sufficiently to wonder why anyone would tell such a far-fetched story in the first place. Think about it: a rabbit delivering colored eggs and candy door to door to help Christians celebrate the resurrection of Jesus Christ.

It's almost as incomprehensible as grown men panting over Playboy Bunnies. What is aphrodisiac about a pair of false ears and a fluffy tail? Stranger still is that the Easter Bunny and Playboy Bunny evolved from the same ancestor.

Which might not have been a rabbit at all, but a hare.

JEFF FOOTT (BOTH)



BLACK-TAILED JACKRABBIT (*LEPUS CALIFORNICUS*).

Rabbit Tale

The word Easter comes from Eastre, or Ostara, an ancient Anglo-Saxon goddess who personified the dawn. She was associated primarily with spring and fertility, as life is reborn each spring after northern Europe's barren winter months. A festival was held in Ostara's honor in April, when fires were lit at dawn to protect crops from frost. In some Anglo-Saxon and German dialects, April is called Ostara's month.

Ostara's familiar animal was a rabbit, a symbol of fertility. Eggs, too, symbolize fertility and birth. According to one story, Ostara transformed a pet bird into a rabbit to entertain some children, and the rabbit proceeded to lay colored eggs that the goddess then gave to the kids. In another version, a small girl asked the goddess to save a bird she found nearly dead from the cold. The goddess saved the bird by turning it into a rabbit, which produced colored eggs.

When Anglo-Saxons converted to Christianity, the celebration of the resurrection of Christ was grafted onto and replaced the pagan festival—both, after all, were dedicated to the idea of rebirth—and the name survived. In fact, only in English and German is the holy day called Easter; in other European languages, the name is a derivation from the Hebrew *pasach*, or Passover, suggesting the day's link to the Jewish holiday.

Some of the old symbols, such as bunnies and eggs, were brought to the United States by German immigrants. And with the American genius for gussying up any event with presents, it wasn't long before the Easter Bunny was delivering chocolate coast to coast. Hippity-hoppity.

And it's hardly a leap, or even a hop, from Ostara the sex goddess and her totemic rabbit to the Playboy Bunny. If the evolutionary biologists are right, sexual attractiveness is really all about fertility, the goal of all right-thinking guys being to produce as many kids as possible. So of course a rabbit makes a pretty sexy symbol. Rabbits really do breed like rabbits, after all. Linguistically, from Ostara come the words estrogen, the female sex hormone, and estrus, the technical term for heat.

The original Easter Bunny was almost certainly a hare, for one very good reason. Rabbits didn't exist in northern Europe when those old-time Saxons were celebrating spring. In fact, rabbits weren't recorded in England until 1235 and in Germany until 1423, although captive or domestic ones reached those places perhaps as early as Roman times. But they've since leapt into popular culture as deftly as they've spread across the continents.

A Rabbit by Any Other Name . . .

. . . is probably a hare. Unless it really is a rabbit. Or a pika, which some call rock rabbits or whistling hares. Some animals called rabbits or hares are not. For instance, the Patagonia hare (*Dolichotis patagonum*) is a mara—a large rodent, as is the springhare (*Pedetes capensis*) of Africa.

JEFF FOOTT

American pika (*Ochotona princeps*).

In any case, pikas, rabbits, and hares belong to the mammalian order Lagomorpha. As a group, the Lagomorpha have long puzzled biologists. Linneaus classified them as rodents, and there they stayed until the beginning of the 20th century, when they were placed in a separate order considered most closely related to rodents. Later, some scientists suggested a closer affinity between lagomorphs, ungulates, and elephant-shrews than between lagomorphs and rodents. Most recently, a 1998 genetics study indicated that the group is most closely related to primates and tree shrews. Stay tuned.

All lagomorphs possess short tails, hind feet larger than forefeet, and unique, peg-like teeth that grow behind the large front incisors. Lagomorphs are herbivorous, living on grasses and herbaceous vegetation, as well as "vegetables" like the carrots favored by Bugs Bunny. They also exhibit coprophagy: literally, eating feces.

Lagomorphs produce two kinds of feces. The first kind is basically a first-cut, digestively speaking, from which some but not all nutrients have been extracted. This gooey black feces is eaten as soon as it is excreted, and then redigested in a special part of the stomach. This second round of food processing extracts more nutrients, and the final-cut feces is in the form of small, hard pellets.

Andrew Smith, a University of Arizona biologist who has studied pikas for more than 20 years, told me that Central Asian folk medicine includes a brew of pika-pellet tea that is prescribed to treat rheumatism. The food writer M.F.K. Fisher, in *A Cordiall Water: A Garland of Odd and Old Receipts to Assuage the Ills of Man & Beast*, relates learning from a Kansas girl the following recipe for reducing a fever: "Gather plenty of turds from the wild jackrabbit, and dry them in the oven to keep for winter in a jar. When the fever will not break, make a very strong tea of the dung and hot water, strain it, and drink it every half hour until the sweating starts. This never fails."

Within the Lagomorpha, rabbits and hares comprise the family Leporidae, while 28 or so species of pikas (also called mouse hares or conies) form the family Ochotonidae. Pikas are smaller than leporids, ranging from just 4.5 to 14 ounces. Their ears are petite and round, their legs short, and their eyes small. Also referred to as "calling hares," most pikas are active during the day and highly vocal. The steppe pika's (*Ochotona pusilla*) screams are reputed to carry four miles. About half of the pika species live on talus (loose rocks) above ground; the rest use burrows. To escape predators, pikas drop out of sight among the rocks or scramble into their burrows.

Scientists now mostly agree that the word "hare" applies only to the 29 or so species in the genus *Lepus*, while "rabbit" describes about 26 species in 10 different genera—the largest number occupying the genus *Sylvilagus*, the

The Japanese pika (*Ochotona hyperborea yesoensis*), or *nakiusagi* in Japanese, lives only in the mountains of Hokkaido Island.

According to the geographer Strabo, who lived from 58 BC to AD 20, a pair of rabbits introduced to the Balearic Islands multiplied to such astonishing numbers that the besieged residents petitioned the Roman Emperor to send troops to kill the rabbits or at least cart them away.


JEFF FOOTT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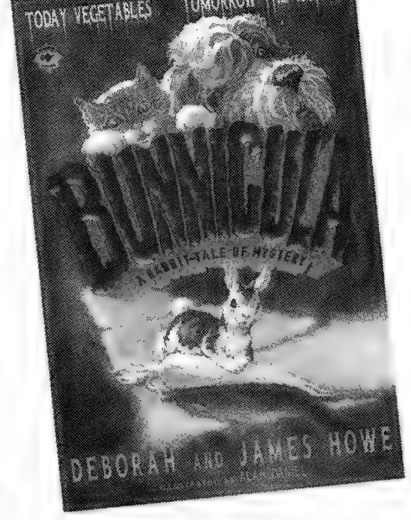
LEFT TO RIGHT: DESERT COTTONTAIL (*SYLVILAGUS AUDUBONII*), EUROPEAN RABBIT (*ORYCTOLAGUS CUNICULUS*), AND MARSH RABBIT (*SYLVILAGUS PALUSTRIS*).

North American cottontails. This is fine for scientists, of course, who actually refer to these animals in daily conversation as, for example, *Lepus californicus* (the black-tailed jackrabbit, a hare) or *Caprolagus hispus* (hispid hare, or bristly rabbit). For the casual observer, hares are bigger than rabbits, with longer legs and long ears usually tipped in black fur. Many rabbits use burrows and retreat underground to escape danger, while hares run away, at sustained speeds of up to 30 miles per hour—and even faster in short bursts. Antelope jackrabbits (*Lepus alleni*) have been clocked at nearly 45 miles per hour.

The word "bunny" is mostly a child's word, applied to either rabbits or hares. Bugs Bunny, for instance, is clearly a hare. In fact, Bugs first appeared in 1940 in a film called "A Wild Hare." Trix® cereal's silly rabbit looks more like a hare, too. Bunnicula the vampire bunny, however, is most definitely a rabbit.

Rabbits are born in a nest of hair and grass in a burrow or special depression on the ground. In some species, the rabbits dig their own burrows; in others, they use burrows abandoned by other animals. Baby rabbits are called kittens. They are altricial, being born naked and helpless, with their eyes shut. Hare babies, called leverets, are born precocial: fully furred, open-eyed, and ready to go. Some rabbits live in groups, while hares are generally solitary. Pikas live in small family groups, and their young too are altricial.



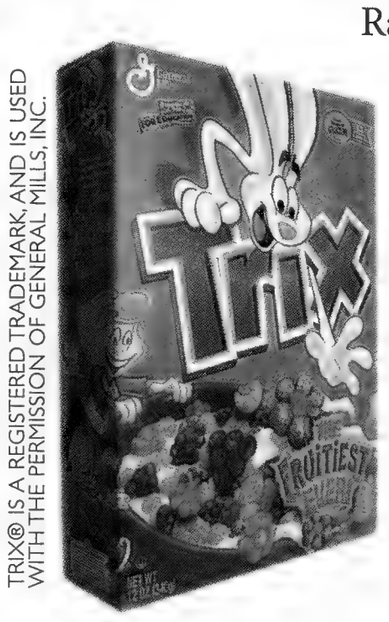
Where in the World?

Most pikas are native to alpine and steppe habitats in Asia. Just two species occur in western North America, and a European population of Asia's steppe pika was recently unearthed in Russia.

Rabbits and hares occur naturally just about everywhere except Antarctica, Australia, New Zealand, Madagascar, and smaller islands. People, however, have made them ubiquitous, infesting most of the lagomorph-less world with one species or another. At least 800 islands, for instance, have at some time been seeded with European rabbits. The first recorded translocation of rabbits was around 1400-1300 BC, when Neolithic Iberians took them to the island of Minorca.

Australia's problems with introduced rabbits are legendary, but not unprecedented. The Aussies really should have known better. According to the ancient geographer Strabo, who lived from 58 BC to AD 20, a pair of rabbits introduced to the Balearic Islands multiplied to such astonishing numbers that the besieged residents petitioned the Roman Emperor to send troops to kill the rabbits or at least cart them away. In this century, a lighthouse keeper released rabbits on Washington's San Juan Island, where their tunnels soon threatened the lighthouse with collapse. Despite the proven risks posed by introducing European rabbits where they don't belong, the United Nations Food and Agriculture Organization (FAO) still encourages villagers in developing countries to acquire and raise rabbits for meat.

Until people started transporting them around, European rabbits were found only on the Iberian Peninsula and the south of France. The Phoenicians who arrived in Iberia in about 1100 BC found rabbits in abundance. However they confused these unfamiliar animals with African hyraxes. So the Phoenicians named the area *i-shepan-im*, "island of the hyraxes," from



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FOOTPRINTS IN SNOW FROM A SNOWSHOE HARE (*LEPUS AMERICANUS*), A KEYSTONE SPECIES OF THE NORTH AMERICAN BOREAL FOREST.

the Semitic word for hyrax, *shapan*, meaning one who hides. From i-shepan-im the Latin name *Hispania* evolved.

These rabbits were the last of several species of *Oryctolagus* that once lived more widely in Europe, but had been forced into their southern refugia during the glaciations of the Pleistocene. It's quite possible that if people hadn't gotten into the act, the species might still be confined to these parts. Indeed, most rabbit species have quite small natural ranges, and while European rabbits breed prolifically once they're somewhere even remotely hospitable, they don't usually spread to new areas quickly. It took about 700 years, for example, for rabbits to conquer all of Britain. Australia is the exception to the rule. Under near-perfect conditions, rabbits here advanced at rates of up to 185 miles a year in the most favorable habitats.

But people did get involved, for one very good reason: As the FAO knows, rabbits make a good meal. Archeologists have evidence of people hunting rabbits in the south of France 120,000 years ago; undoubtedly, hominids were eating lagomorphs earlier than that. Romans began systematically exporting rabbits (*Oryctolagus* sp.) from Iberia to the Mediterranean islands and Italy, and eventually to all parts of the empire. Romans kept rabbits, hares, and often deer and birds in leporia: enclosed spaces several acres in size. Sometimes a small island served as a leporia, without the attendant cost of building a walled enclosure. Within the enclosure, it was an easy task to snatch up a meal as needed.

The Romans did not domesticate rabbits, however. They simply caught them, held them, and ate them. Many rabbits escaped from the leporia—not so hard given the animals' ability to burrow under and out—and these were likely the least tame individuals. Most escapees were probably taken by predators, but a few survived to begin wild populations far from their native haunts. As people transformed the European landscape from forest to farm, the decline of predators further abetted the spread of rabbits.

Medieval French monks are credited with domesticating rabbits between AD 500 and 1000. The monks had very special needs, apart from a taste for rabbit meat. At a time in Catholic Europe when even lay people had more fast days on the calendar than not, fetal or newborn rabbits—long a delicacy—were deemed "fish" by the Church authorities. Thus, monks could eat quite well on "laurices." For the monks to monitor

pregnant females and be on hand at the moment of birth, the laissez-faire Roman style of keeping rabbits had to go. The monks instead kept their rabbits in smaller, high-walled and paved courtyards, forcing the rabbits to breed and give birth on the ground.

With greater control, selective breeding eventually produced larger animals. Domestics are now twice or more the size of the original Iberian rabbit. Breeds of various colors didn't appear until perhaps the 16th century, and fancy breeds were created fairly recently (see "Breeds Like a Rabbit," below).

Today, domestic rabbits have smaller brains, poorer vision and hearing, larger litter sizes, and are less timid than their wild cousins. Domestic rabbits still escape or are released from captivity quite often, and some manage to survive and reproduce. Released or escaped rabbits of fancy breeds usually quickly revert to the wild type. Eventually, wherever people take them feral populations are likely to appear.

During the age of exploration sailors released rabbits, as well as pigs and goats, on far-flung oceanic islands so that crews on passing ships could stop for a bit of fresh meat. Sealers continued this practice into the 19th century. More recent rabbit introductions, such as those in Australia and New Zealand, have been for sport first, and for food only secondarily. European hares were also introduced to Australia, but less successfully than in South America.

These introductions have usually had devastating effects on the native flora and fauna, most famously in Australia. From a handful of individuals released in the 19th century, rabbits in enormous numbers soon marched across vast swathes of southern Australia like a hungry barbarian army. If the rabbits didn't exactly sack, they certainly did pillage. Farmers and ranchers were helpless to protect their crops and pastures from these little eating machines. Native species, such as the bilby (*Macrotis lagotis*)—a burrowing marsupial also called the rabbit-eared bandicoot—and the boodie (*Bettongia lesueur*), the only burrowing kangaroo, disappeared, eaten and driven out of house and home. Australians today are still trying to control their bunny outbreak.

Sport hunting of both hares and rabbits has a long tradition, as does using them as bait in coursing. A story is told of a battle fought between Scythians and Persians in 512 BC in which a hare was released between the opposing forces, and soldiers on both sides deserted their posts to hunt it. Ancient Greeks hunted hares with dogs, creating a special breed that is still used for this task today: greyhounds. Hares and rabbits remain the most popular game animals in the United States and across Europe.

Hares have been food as long as rabbits have, although their meat is very different. Hare meat, for instance, is dark, while rabbit meat is white and less strong in taste. Some cooks serve hare rare like beef, while rabbit is always well-done, like chicken, which it resembles in taste. Older cookbooks, written without regard to the benefits of a low-fat diet, recommended "larding" your rabbit before cooking it. (For the non-foodie, this means embedding extra fat—often via strips of bacon—into the meat.) Today, however, rabbit meat is pushed as a low-fat, low-cholesterol alternative to chicken and pork.

JEFF FOOTT

BLACK-TAILED JACKRABBIT IN THE SONORAN DESERT.

Prodigious Prey

Chinese legend has it that the moon is inhabited by a white hare. The explanation goes something like this: Three wise men took on the guise of old beggars and asked a fox, a monkey, and a hare for something to eat. Even though they had food to offer, the fox and monkey declined to share. The hare had nothing to give so it leapt into a fire, cooking itself to make a meal for the poor old men. The animal was rewarded for its sacrifice with an exalted position in the heavens.

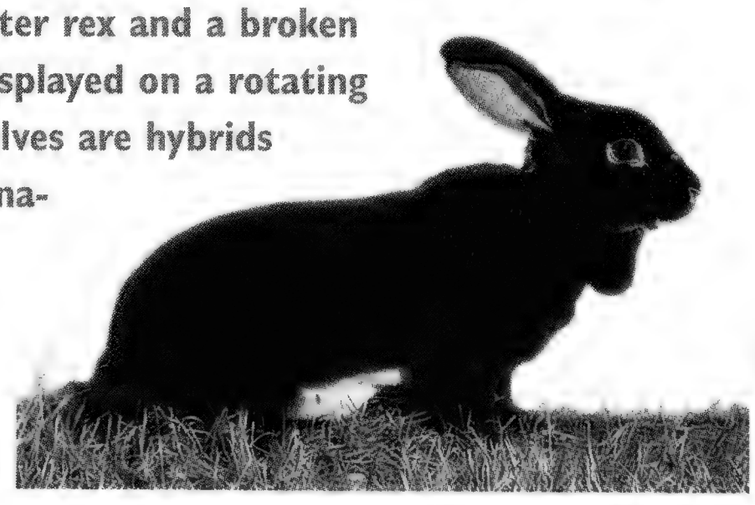
The biological truth in this story is that everyone, and everything, eats lagomorphs. And I mean everything. In Spain, biologists report about 40 different species that eat Iberian rabbits. This list includes four reptiles, 19 birds of prey (including the endangered imperial eagle, *Aquila heliaca*—a huge raptor with a wing span of about seven feet), and 17 mammals, includ-

BREEDS LIKE A RABBIT

Monks first domesticated European rabbits (*Oryctolagus cuniculus*) for meat during the Middle Ages, and in time rabbits were bred for a variety of desired traits. Angora rabbits soon were valued for their long hair, Flemish giants for their large size and prolific reproduction. Over the last 100 years, rabbits have also been sought as pets, and so different colors, markings—and even big, floppy ears—have been created through artificial selection. Domestic bunnies today often bear little resemblance to their wild, European ancestors.

You can come see for yourself the wonders of selective breeding at the domestic rabbit exhibit at the National Zoo. A giant chinchilla and an American chinchilla—breeds named for their soft, grayish coats—as well as a black otter rex and a broken rex, a Flemish giant, and an English spot are all displayed on a rotating basis in Beaver Valley. Many of these types themselves are hybrids of other breeds—such as the broken rex, a combination of the English spot and the black otter rex. Visitors can flip through colorful identification cards to distinguish the individual breeds grazing in the grass.

—Alex Hawes



JESSIE COHEN/NZP

BLACK OTTER REX.

RABBITS AND PEOPLE HAVE CROSSED PATHS FOR CENTURIES. SOME SPECIES, SUCH AS EUROPEAN RABBITS AND BLACK-TAILED JACKRABBITS (ABOVE), FARE BETTER THAN OTHERS IN HUMAN-ALTERED LANDSCAPES.

ing the critically endangered Iberian lynx (*Lynx pardina*).

Fewer than 800 lynx survive in ten isolated areas on the Iberian peninsula. According to the World Wildlife Fund, the Iberian lynx is the most endangered of all the cats. This predator is highly dependent on rabbits, and the two species are believed to have evolved together. Between 75 and 95 percent of the Iberian lynx's dietary intake is rabbit, and a lynx's daily energy needs can be satisfied by a single, two-pound bunny. Declining rabbit numbers, largely due to disease and habitat conversion, are believed to be directly responsible for the lynx's critical status. Lynx also die in snares people set to trap rabbits—which in Spain, as elsewhere, are highly prized by both hunters and diners.

North American lynx (*Lynx canadensis*) are also tightly linked to a lagomorph: the snowshoe hare (*Lepus americanus*). Naturalist Ernest Thompson Seton wrote of the North American lynx: "It lives on rabbits, follows the rabbits, thinks rabbits, increases with them, and on their failure dies of starvation in the unrabbited woods." Every ten years or so, populations of snowshoe hare drop suddenly, for unknown reasons perhaps related to changes in their food supply. Lynx must search over larger areas to find enough to eat; reproductive rates decline, and many lynx starve. Gradually, however, snowshoe hare populations begin to recover, and then the lynx population follows—before the cycle begins anew.

During the age of exploration sailors released rabbits, as well as pigs and goats, on far-flung oceanic islands so that crews on passing ships could stop for a bit of fresh meat.

Even where European rabbits are relative newcomers to the menu of prey species, they play an important role in maintaining predators. In Australia, three species of introduced mammals—foxes (*Vulpes vulpes*), cats (*Felis catus*), and dingos (*Canis familiaris dingo*)—eat rabbits almost exclusively on farm lands where native prey of this size are gone. In addition, 13 species of birds of prey depend on rabbits. Where other prey are scarce, the wedge-tailed eagle's (*Aquila audax*) diet may be 97 percent rabbit. After rabbits were decimated by rabbit hemorrhagic disease in the mid-1990s, wedge-tailed eagles failed to breed for three years in a row in one region of the continent.

Controlling these rabbits as pests therefore creates a dangerous situation for many birds that now depend on them. What's more, when rabbit numbers fall, predators seem to turn to native mammals, many of which are endangered. What a tangled web we have woven for the world's wildlife.

While the European rabbit is one of the best studied and most ubiquitious mammals on Earth, the rest of the lagomorphs are anything but. Mexico's Omiltemi rabbit (*Sylvilagus insonus*), for instance, is known from only three museum specimens collected years ago and from a more recently collected chewed-on skin.

One-quarter of all rabbit and hare species and one-fifth of all pika species fall into some category of conservation concern, from vulnerable to critically endangered. It seems paradoxical that animals that breed like rabbits are in trouble. But that is another story.

—Susan Lumpkin is Editor of ZooGoer.

BIO-ALMANAC

GOOD NEWS

Plans for forming a trans-border conservation area encompassing land from Mozambique, Zimbabwe, and South Africa neared completion when government ministers from these countries met on May 2 in Harare, Zimbabwe. The proposed Gaza-Kruger-Gonarezhou (GKG) Transfrontier Conservation Area, joining valuable wildlands in the three countries, would become the largest trans-border conservation area in the world, spanning roughly 38,000 square miles.

The new park would join the war-torn Gaza province of Mozambique with South Africa's Kruger National Park and Zimbabwe's Gonarezhou National Park—a natural migratory triangle for animals living in this region (see "Kruger: The Once and Future Park" in the November/December 1998 *ZooGoer*). One of the richest areas of vertebrate diversity in southern Africa, Kruger is home to 147 species of mammals, 505 species of birds, 119 species of reptiles, 51 species of fish, and 35 species of amphibians. The proposed transfrontier conservation area would allow elephants, buffalo, and other animals crowding Kruger to populate adjacent areas of depleted natural diversity.

Ministers from Mozambique, South Africa, and Zimbabwe were expected to finalize the agreement on June 19 in Kruger National Park. The finalization of the GKG Transfrontier Conservation Area follows on the heels of the official opening of another trans-border preserve in southern Africa. President Thado Mbeki of South Africa and President Mogae of Botswana ratified Kgalagadi Transfrontier Park, Africa's first formally declared transfrontier park, on May 12. The agreement officially united Gemsbok National Park in Botswana and Kalahari Gemsbok National Park in South Africa.

Kgalagadi and Gaza-Kruger-Gonarezhou are just two examples of a trend sweeping through southern Africa to create parks spanning national borders, potentially benefiting the economies of participating countries with increased tourism and the animals with expanded habitats.

BAD NEWS

Florida manatees (*Trichechus manatus latirostris*) are again dying at an alarming rate in the coastal waters of the southeastern United States. While the population of wild Florida manatees has rebounded in recent years—thanks to legal protection and boater-education efforts—humans still pose a grave threat to this wrinkled creature. Thirty-two manatees are believed to have been killed by motorboats through March of this year, a pace expected to surpass last year's total of 82 killed, the highest number recorded to date. Only a total of 2,400 Florida manatees survive in the wild.

A half-ton heavy, the manatee has no natural enemies. This slow-moving animal lives in shallow waters and has to surface every four minutes on average to breathe, making it especially vulnerable to speeding boats. More than 40 percent of manatee deaths can be attributed to humans, estimates the Save the Manatees Club (SMC), while nine manatees in ten bear scars from run-ins with motorboat propellers. "Florida's manatees just can't keep sustaining these major losses without it causing irreparable harm to the entire wild population," said Judith Vallee, SMC's executive director.

ALEX HAWES/FONZ

ELEPHANT IN KRUGER NATIONAL PARK.

Habitat loss causes even more damage than motor boats. Construction of marinas and other obtrusive structures have consumed much of the shoreline along which manatees feed, sleep, and breed. Florida manatees migrate as far west as Louisiana along the Gulf Coast, and as far north as Virginia along the Atlantic. The continuing development of the coastal Southeast thus spells bad news for these creatures that inspired crewmen on Christopher Columbus' American voyages to bring home tales of mermaids.

AMAZON DISCOVERY

A dozen new species of monkeys, five new birds, a new deer, and a new peccary have recently been described in Brazil. Marc van Roosmalen of the National Institute for Amazon Research in Manaus found the species previously unknown to science in a part of the Amazon he calls "terra incognita for biologists." The area, near the Rio Madeira, may foster species diversity because rivers there have split the ecosystem into isolated zones.

However, this biologically rich region is no pristine playground for the unsuspecting scientist. "The Madeira was and still is filled with big black caimans that attack every animal that tries to swim to the other side," notes van Roosmalen. (It's little wonder, then, that these species took so long to be recorded!)

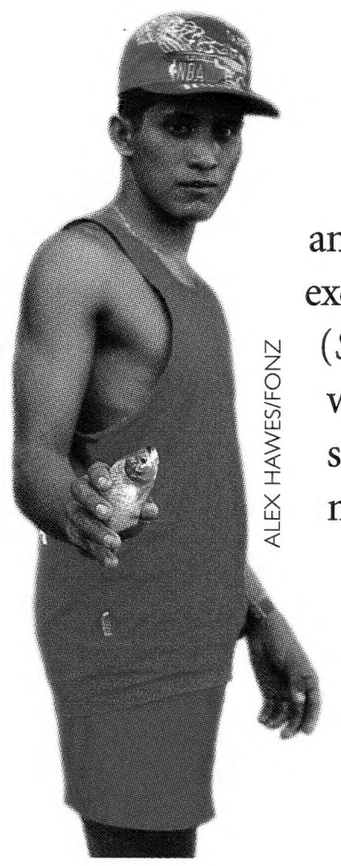
WHAT'S IN A NAME?

Few animals have as ferocious a reputation as piranhas (genus *Serrasalmus*), freshwater fish found in the tropics of South

America. The name, inspired by the piranhas' razor-sharp triangular teeth, comes from the Portuguese *piro* for "fish," and *sainha* for "tooth." Piranhas are also known locally as *caribe*, derived from the Carib, an indigenous group for which the Caribbean Sea was named. Columbus also reported hearing the feared Carib tribe in Cuba called *Caniba*—literally, "strong men"—and indeed believed this group to be cannibals.

Like their tribal namesakes, piranhas have long been thought to eat humans. However, reports of the man-eating fish—not to mention the man-eating men—are greatly exaggerated. Most of the more than 20 species of piranhas found in the Amazon are omnivorous, eating both seeds as well as the meat of other fishes or wounded animals who stray into the water. Even the most bloodthirsty piranhas, however, cannot eat an entire animal by themselves; instead they merely nip off scales or bits of flesh. And only when herded together by low waters during the dry season will most species of piranha congregate in large schools, the only time when healthy mammals (and humans) need fear treading in rivers and lagoons. The one exception is the caju (*Serrasalmus nattereri*), which does form large schools. The caju is the most publicized piranha species, helping to spread misconceptions about this widely varied fish.

—Katie Venit and Alex Hawes



ALEX HAWES/FONZ

A NOT-SO-DEADLY PIRANHA.

BOOKS, NATURALLY

Medicine Quest: In Search of Nature's Healing Secrets.
Mark J. Plotkin. 2000.
Viking, New York.
224 pages, clothbound.

"Microbes Winning War" was the headline of a front-page story in *The Washington Post* on June 13. The story summarized a World Health Organization (WHO) report on increasing resistance to all available antibiotics, raising the specter of a return to the "preantibiotic era" when bacterial infectious diseases killed people like flies. The headline of WHO's own press release warned that resistance could "rob the world of its opportunity to cure illnesses and stop epidemics."

Reading *Medicine Quest: In Search of Nature's Healing Secrets* alleviates some of these fears. As renowned ethnobotanist Mark Plotkins reveals, the natural world is teeming with creatures that might hold the keys to cures for all that ails us. Indeed, the problem is too many potentially useful species.

Fungi, for instance, are the source of many of our antibiotics, including penicillin, the miracle drug that opened the "antibiotic era." But there are probably more than 13 million species of fungi, only about 70,000 of which have been studied in the laboratory, not to mention millions of bacteria, another source of antibiotics, and other, unexpected potential sources like the secretions of frogs' skins! Where do we start to look for ones that might work?

One way is to look to the pharmacoepia of traditional medicine, which, after all, was the only medicine until the 20th century. Plotkin has devoted his life to this, focusing on uncovering the secrets of the shamans of the Amazon. His best-selling 1993 book, *Tales of a Shaman's Apprentice*, introduced the wisdom of these medicine men—his mentors—to the world. In *Medicine Quest*, Plotkin returns to his rainforest roots to tell a fascinating if frustrating story of his search for a treatment for diabetes. Despite his witnessing a shaman's successful treatment of a woman dying of diabetes, scientific analysis of the shaman's plant-based potion so far has come up negative. But in this new book, Plotkin also explores the work of many scientists who are "embarking on a medicine quest in search of new healing compounds from the world around us."

As good a read as any thriller—this is science you can read on the beach—*Medicine Quest* is rich in colorful writing about amazing, bizarre, and sometimes disgusting stories of medicines from nature. Take the medicinal use of maggots (please!). In a chapter entitled "Hideous Healers," Plotkin writes "...maggots of certain species of blowflies consume only putrefying flesh while, at the same time, they promote healing." Applied to wounds, maggots eat bacteria, secrete sterilizing chemicals, and "promote the growth of healthy tissue by stimulation massage as they crawl through the wound."

Leeching has also returned to medical practice. It turns out that the saliva of leeches, like that of other bloodsucking animals including vampire bats, contains various anti-coagulant chemicals useful in dissolving blood clots and treating other blood-related ailments. More directly, leeches are used after microsurgery to reattach a severed body part—an ear or finger, for example. Microsurgeons can reconnect arteries to bring blood into the reattached part but veins taking blood from the area often must be left to heal on their own. The leeches suck the blood from the body part until the veins start working.

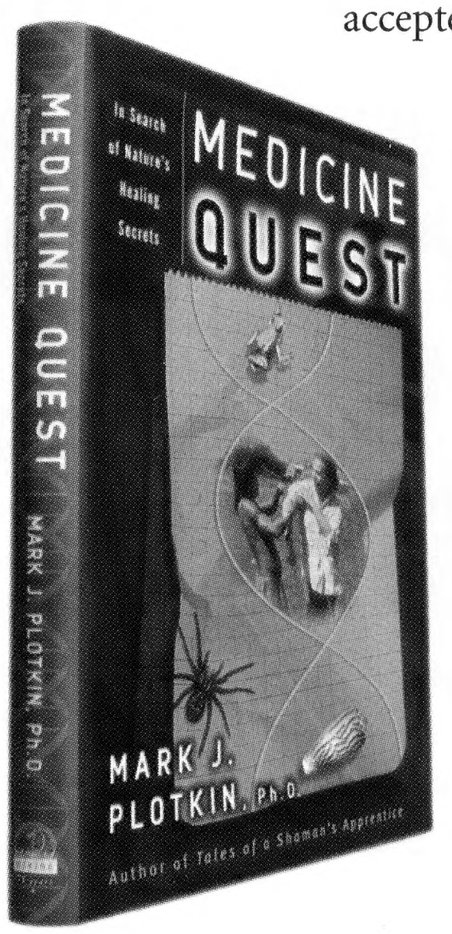
Medicine Quest regales the reader with dozens of such stories about potentially healing chemicals in the venom of snakes, spiders, and cone snails, and the secretions of sponges and sea squirts. Nor are plant medicinals ignored. While many herbal treatments are increasingly accepted by consumers, if not by the medical establishment, others have yet to regain their former popularity.

For instance, haven't you always wondered about the myrrh and frankincense that joined gold in the three Gifts of the Magi? Myrrh, a tree resin, was a rare and valuable medicine—the penicillin of the ancient world. Frankincense is also a resin from a closely related tree. Modern experiments support the old wisdom. These resins are antifungal, anti-inflammatory, relieve pain, kill some bacteria, and more.

Silphium, a species of wild fennel, was used by ancient Greeks and Romans as a safe and effective female contraceptive. Plotkin reports that it was then worth more than its weight in silver. Modern studies of common fennel reveal some contraceptive activity, but we'll never know just how truly effective silphium was. As Plotkins writes, "Due to insatiable demand for the plant in ancient Greece and Rome, silphium went extinct about fifteen hundred years ago."

The fear that we might lose many, many other cures from nature gives urgency to Plotkin's and others' quest. Both species, and the practitioners of traditional medicine who know their uses, are disappearing faster than we can learn their secrets. This fact offers an incentive for conservation to people otherwise unmoved by the disappearance of wildlife and wildlands. Plotkin concludes with this message: "If we deprive ourselves of the weapons needed to combat and defeat diseases that always have threatened us (and always will), we endanger ourselves." After reading *Medicine Quest*, I'm sure you will agree.

—Susan Lumpkin



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